Coordinated Garbage Collection for RAID Array of Solid State Disks

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Technology Summary

An ORNL invention that replaces existing magnetic disks with solid state disks, which have no mechanical moving parts, can more efficiently store, move, or clear unwanted data. The invention uses Global Garbage Collection (GGC) technology to enhance both storage and retrieval performance in future solid state disk-based computer systems. The new technology functions on both servers and mass consumer computers.

The ORNL technology uses solid state disks in a coordinated RAID array. RAID, or Redundant Array of Independent Disks, is an umbrella term for computer data storage that can divide and replicate data among multiple disk drives. Data is stored across all disks in such a way that if a single drive fails, the data can be retrieved and reconstructed by the remaining disks.

In the invention, a controller is coupled to the solid state disks. The controller globally coordinates the "garbage collection" activities of each of the disks, and can schedule and perform a globally coordinated memory scan over all disks in a given RAID array—reclaiming space when possible. The controller can also arrange the garbage collection in an active mode, in which collection cycles begin on all disks in the array at a scheduled time, or it can query the disks to determine the best time to start a global collection .

Advantages

- Solid state disks have no mechanical moving parts, which eliminates disk head seek latencies and increases performance for input/output workloads
- Solid state disks are compatible with existing disk technologies, which allows for easy replacement of magnetic disks with solid state disks in existing systems
- Solid state disks have lower power consumption, lighter weight, higher resilience to external shocks, and the ability to sustain hotter operating regimes
- As solid state disk technologies mature, mass production costs are dropping

Potential Applications

- High-performance RAID controller devices for high-end servers and mass consumer computers
- New solid state disk devices for high-end servers and mass consumer computers

Patent

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